Ecomagination's carbon diode

GE Global Research has developed an ideal carbon nanotube diode, that operates at the "theoretical limit," or best possible performance - a significant improvement on its original nanotube diode device announced last year.

The GE team, led by Dr. Ji Ung Lee, made a related discovery when it observed a photovoltaic effect in the nanotube diode device. This is a development that could lead to new approaches and breakthroughs in photovoltaic research.

Photovoltaics research is a key component of GE's Ecomagination initiative, which was launched in May. Ecomagination represents the company's commitment to aggressively drive and bring to market new technologies that help its customers address their most pressing energy and environmental challenges.

Under Ecomagination, GE has pledged to more than double its level of investment in the development of new, environmental-friendly technologies from $700m to $1.5m, over the next five years.

As part of this, GE Global Research has an active program in photovoltaics that is investigating how to generate power from sunlight more cost effectively and more efficiently. The recent discovery of a photovoltaic effect in the carbon nanotube diode device will only help further the ongoing research efforts.

Diodes are fundamental semiconductor devices. Unlike traditional diodes, GE's carbon nanotube device has the ability to perform multiple functions - as a diode and two different types of transistors - which should enable it to both emit and detect light.

In addition to opening new doors in photovoltaics research, GE's carbon nanotube diode device could have many applications in computing, communications, power electronics and sensors.

The carbon nanotube diode was developed by a team led by Dr. Ji Ung Lee, a micro and nano-structures technologies scientist, working in the Nanotechnology Advanced Technology Program at the GE Global Research Center in Niskayuna, N.Y.

The p-n junction diode forms the basis for nearly all electronics and therefore, its quality is often a good predictor of the performance of a semiconductor device.

Diodes are formed by joining a p-type and an n-type semiconducting material. In the GE device, the two regions were formed using an electrostatic doping technique, using two separate gates that couple to two halves of a single carbon nanotube.

By biasing one gate with a negative voltage and the other with a positive voltage, a p-n junction can be formed. GE scientists discovered that an ideal diode could be realised by suspending the middle portion of the carbon nanotube where the carrier recombination occurs.

These results show that carbon nanotubes can be very sensitive to the substrate that they are in contact with, and provide important clues to the fundamental workings of any carbon nanotube based devices.

The scientists further elaborated on the ideal diode behavior, by examining their photovoltaic properties. Despite being some 1000 times smaller than the wavelength of light, the carbon nanotube diodes showed significant power conversion efficiencies, owing to the enhanced properties of an ideal diode.

The full technical paper on this research is available in the August 15, 2005 issue of *Applied Physics Letters*.

Web: http://apl.aip.org/

Nanocoats defog glass and lenses

Scientists at MIT developed a polymer coating - made of silica nanoparticles - that might create unfogable surfaces. The transparent coating can be applied to a variety of lenses.

Anti-fog technology has been in development for years, but each approach had drawbacks. There are anti-fog sprays that reduce fogging, but they must be constantly reapplied to remain effective.

Glass containing titanium dioxide also shows promise for reduced fogging, but the method only works in the presence of ultraviolet light.

"Our coatings have the potential to provide the first permanent solution to the fogging problem," says study leader Michael Rubner, at MIT.

"They remain stable over long periods, don't require light to be activated and can be applied to virtually any surface."

The coatings consist of alternating layers of silica nanoparticles, which are basically tiny particles of glass, and a polymer called polyallylamine hydrochloride, both of which are relatively cheap to manufacture.

He has applied for a patent on the manufacturing process and says that the coating could be available in consumer products in two to five years. The military and at least two major car manufacturers have already expressed interest.

Wisair introduces UWB module for development

Ultra Wideband and Wireless USB solutions Wisair, has introduced a UWB physical layer module to ease development of applications with Intel's Peripheral Development Kit for Certified Wireless USB.

The Wisair PHY module with the CW USB PDK allows PC peripheral makers and consumer electronics brands to develop applications and guarantee interoperability between host PCs and peripherals based on the CW USB specification. The Wisair UWB module was specifically designed to support electrical and mechanical design of the CCW USB PDK.

"Wisair's module, and other PHY vendors will greatly aid the integration and development of applications based on the CW USB technology," said USB-IF chair, president and Intel strategist, Jeff Ravencraft.

"We believe that Certified Wireless USB products using WiMedia radios will be commercially available in the next 12 months," he added.

"We greatly value Intel's contribution to the enablement of the Wireless USB market and will continue to closely support these efforts," said David Yaish, Wisair president and CEO.

Web:http://www.usb.org/developers/estoreinfo/
Web: http://www.wisair.com/